Use of Ventricular Access Device Policy (Paediatrics)

Version: 2.1

Executive Summary	Children with shunted hydrocephalus are at a serious risk of morbidity and mortality from shunt dysfunction/block. Almost all the patients at NHS Lothian have a device (ventricular access device) that can be used to ascertain such shunt dysfunction as well as to relieve pressure until the patient is taken for definitive corrective procedure. This procedure saved life on many occasions and hence a critical skill. In case of intractable ventriculitis, often in the context of infected ventricular-peritoneal shunt, antibiotics are administered intraventricularly (also termed intethecally). These procedures are performed occasionally but carry a significant risk and there is a need to maintain a cohort of professionals who adequately trained to maintain a safe service for these patients. This document, along with the accompanying documents, delineates the process, describes the indications, the details of the procedure and the competencies required to be achieved by the relevant professionals. A demonstration video is available on the intranet.
Keywords (Minimum of 5)	Ventricular access device, Intraventricular/Intrathecal, ventriculitis, antibiotics, Intracranial Pressure (ICP)
Target Audience	Paediatric neurologists and relevant Paediatric trainees, Neurosurgeons and relevant neurosurgical trainees, Neonatologists, Senior Paediatric Neurosciences staff nurses, Relevant Pharmacists
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1.0 Introduction

The Paediatric Neurosciences Unit at the Royal Hospital for Sick Children (RHSC) in Edinburgh is a tertiary care centre, serving children and young people who require management of a broad range of neurosurgical, neurological and associated conditions. The unit serves as one of the four paediatric neurosurgical centres in Scotland. All three categories of paediatric neurosurgery, as defined by the Managed Service Network, are performed within the hospital (MSN, 2015). As such, an intervention referred to as External Ventricular Drainage (EVD) is frequently used in the management of children and young people admitted for in-patient care. Children requiring EVD are primarily looked after on the Neurosciences Unit; however, this document also pertains to the care of patients under the care of the neurosciences team being looked after in other areas of the hospital, for example, in critical care.

A collaborative approach between surgical, medical and nursing staff is to be demonstrated at all times, to assure patient safety and evidence based practice in relation to the management of children and young people requiring an EVD device.

The care of paediatric neurological/neurosurgical patients may be complex and it is proposed that the training and competence elements will be presented within two different procedures:

- The ‘Tapping Ventricular Access Device and Implementation of CSF Drainage Procedure’ (Appendix 1), will focus on the competency required in order to safely ’tap‘ a ventricular access device (VAD) using strict aseptic, non-touch technique (ANTT); the ability to measure intracranial pressure (ICP) and the collection of cerebrospinal fluid (CSF) samples. This skill should be expected of all the doctors who may come in contact with paediatric neurosciences patients with a ventricular access device who may need an urgent 'tap'. It is envisaged that all Clinical Coordinators/Senior Nurse Practitioners/senior nurses on the Paediatric Neurosciences ward also become competent in this procedure.
- The ‘Intrathecal Antibiotic Administration Procedure’ (Appendix 2) covers the administration of intrathecal antibiotics. This should be undertaken by all trainees of grade ST4 and above, after being assessed as competent. It is encouraged that a core group of Clinical Coordinators/Senior Nurse Practitioners/senior nurses on the paediatric neurosciences ward should also be able to retain this skill.

This document does not include intrathecal baclofen administration.

2.0 Who does this policy apply to?

Within working hours, the Paediatric Neurosciences team will deliver this service. It is expected that the on-call team will have to deliver these procedures out of hours. Therefore, all paediatric trainees on the 'specialty rota' and the relevant nursing staff must ensure that they are adequately trained.

In 2006, Scottish Executive Health Department issued ‘Guidance on the safe handling of intrathecal and intraventricular injections’. The RHSC Edinburgh ’Protocol for the safe handling of Intrathecal and Intraventricular Injections’ (Appendix 3) complies with this guidance and

requires **all** staff who are involved in the administration of intrathecal medicines to be trained, assessed and their names entered on an intrathecal register.

3.0 Duties and responsibilities

Within RHSC, the responsibility for training and assessment of medical staff is the ultimate responsibility of the Clinical Director, but the management of this has been delegated to the Department of Paediatric Neurosciences.

The Department will be conducting regular 'training and update' sessions. It is the responsibility of the involved professionals to be trained and kept up-to-date. Competency is re-assessed/updated every two years.

As part of training, staff are required to read the RHSC 'Protocol for the safe handling of Intrathecal and Intraventricular Injections' and the references listed in it.

Training and assessment will be undertaken by the paediatric neurosciences team, including doctors of grade ST4 and above and a core group of Clinical Coordinators/Senior Nurse Practitioners/senior nurses for the following procedures:

1. The tapping of ventricular access devices and measuring ICP

2. The setting up of external ventricular drainage

3. The administration of INTRATHECAL ANTIBIOTICS via a VAD, a direct ventricular drain, Lumbar Puncture (LP) needle or a Lumbar Drain.

Stages of competencies

Stage 1:	a. Understand the principles of tapping VAD under aseptic precautions and measuring ICP. Practice on mannequin. b. Observe the VAD access and pressure measurement procedure on a patient when a competent colleague performs the procedures and measures the ICP.
Stage 2:	Perform on patient under supervision until competent
Stage 3:	Competency in intrathecal/intraventricular antibiotic administration
Stage 4:	*Intrathecal Baclofen. This document will not cover stage 4.*

4.0 Main Policy Content - Clinical Information

4.1 External Ventricular Drainage

There are a number of conditions which require a reduction of elevated intracranial pressure (e.g. due to hydrocephalus, before definitive treatment such as VP shunt; acute shunt block;

management of shunt infection; abscess; tumour; trauma) where a patient may require drainage of CSF. In RHSC, this is normally achieved by the surgical insertion of a ventricular access device (also known as an Ommaya reservoir) which is linked to an external ventricular drainage (EVD) collecting system. However, it can also be achieved by the insertion of a tunnelled EVD catheter which attaches directly to the EVD collecting system, without the need for a needle. These catheters are stitched in place and can be easily pulled out, so care is required during procedures. They are usually changed to a clean catheter, in theatre, every 5-7 days.

As mentioned above, EVD is of major importance in the treatment of patients with hydrocephalus; acute shunt dysfunction (as a temporising measure); ventriculitis, requiring prolonged ICP monitoring; major head injury; subarachnoid haemorrhage; brain tumour and many other causes of increased ICP. CSF samples from these patients may have to be taken on a regular basis (see sampling) and sent to microbiology to exclude acquired infection, or to monitor progress of treatment. Sometimes a VAD has to be accessed to measure the ICP e.g. in cases of suspected shunt blockage.

4.2 CSF tapping and sampling

4.2.1 INFECTION PRESENT:

CSF sampling may be performed daily (depending on the Consultant's advice), if infection is present, and sent to microbiology. Analysis of CSF includes cell count, gram stain, cultures (Microbiology), protein, glucose (Biochemistry) and cytospin for differential cell type (Haematology).

Once trained and assessed as competent, staff can sample CSF from the patient's EVD on a daily basis (or as required), for gram stain, culture and cell counts. This is important in monitoring the response to treatment. The results should be documented on a separate CSF results chart (available on the RHSC Paediatric Neurology ward) and should be placed with the observation charts at the foot of the patient's bed or in patient's medical notes.

4.2.2 NO INFECTION:

If the patient does not have ventriculitis or meningitis but is on EVD or lumbar drainage for hydrocephalus/CSF leak etc., sampling can be performed as requested by the consultant, or every 48 hours as is appropriate and determined by the clinical situation (e.g. a VAD in an oncological patient who awaiting surgery but has no infection). Sometimes the VAD has to be accessed simply to measure the ICP.

4.3 Ventriculitis and its treatment with intrathecal antibiotics

Ventriculitus may be defined as inflammation of the ventricles of the brain. Infection is often secondary to shunt infections or long term external ventricular drainage. The incidence of shunt-associated ventriculitis varies according to age, being common in premature babies and neonates (up to 70% of cases) and less common in adults (5-15% of cases). The responsible organisms are usually gram positive, coagulase negative cocci; commonly *Staph epidermidis* or sometimes *Staph aureus*. Occasionally gram negative bacilli are responsible, and rarely other

organisms such as *corynebacterium*, *E Coli* or *candida*. These can be seen on gram stain and culture and there is usually a reactive CSF with lots of white cells.

CSF penetration of many intravenous antibiotics is poor because of a failure to cross the blood-brain barrier and therefore direct administration of antibiotics into the intrathecal (intraventricular) space is often considered. Intraventricular antibiotics have been used at RHSC for over 20 years with no reported profound adverse effects.

The majority of patients will receive intrathecal antibiotics via a VAD, however where this route is not available, the intrathecal antibiotic may be given via a lumbar drain.

Vancomycin and gentamicin are the only two antibiotics currently used for intrathecal administration in RHSC. The usual antibiotic of choice is vancomycin with the decision often being made by the consultant and may be guided by the microbiologists. Treatment is usually for at least seven days, but may be shorter or longer depending on the patient's clinical response and CSF cell counts.

5.0 Monitoring compliance

All training and assessment will be formally documented as evidence of competency. The names of the professionals who have achieved the competencies will be maintained electronically on the intranet (and as a hard copy) by the RHSC Pharmacy Department. Until the name of a professional is entered in the register, he/she will not be eligible to perform the procedures without supervision.

6.0 Policy review

This document and the procedures 'Tapping Ventricular Access Device and Implementation of CSF Drainage Procedure' (Appendix 1), 'Intrathecal Antibiotic Administration Procedure' (Appendix 2), and accompanying Competency Assessments were derived from a review of 'Training for medical staff and senior nurses on: Tapping of Ventricular Access Devices, External Ventricular Drainage and Administration of antibiotics via the intrathecal route', 2013-2016.

7.0 Associated documents

- Tapping Ventricular Access Device and Implementation of CSF Drainage Procedure
- Intrathecal Antibiotic Administration Procedure
- Protocol for the safe handling of Intrathecal and Intraventricular Injections

8.0 Supporting references

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